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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,896	12/27/2005	Masanori Sakai	1592-0201PUS1	2272

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EXAMINER	
CHANDRA, SATISH	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
06/05/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/529,896	SAKAI ET AL.	
	Examiner	Art Unit	
	SATISH CHANDRA	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 April 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3 - 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/05, 12/05, 12/06, 9/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3 – 6 and 8 - 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (US 2002/0073923) in view Oh et al (US 2001/0029891).

Saito et al disclose:

Regarding claims 1 and 8, a substrate processing apparatus comprising:

A reaction chamber 11 (Fig 1)

An exhaust port 61 (Para 0099) for exhausting gases from the reaction chamber

A gas supply system 35a, 35b, 35c and 35d for supplying at least a plurality of reaction gases (such as DCS, SiH2Cl2 and ammonia, Para 0093, 0094) to the reaction chamber wherein the gas supply system comprises:

A cleaning gas supply unit, 35d (Para 0097) for supplying cleaning gas (such as HF, Para 0097) to the reaction chamber. Post-processing gas supply units (reaction gas supply units) 35a, 35b for supplying post processing gas exclusively through the gas supply pipes (nozzles) 31a, 31b, 31c in the reaction chamber (Para 0093, 0094, 0095 and 0097) wherein each of the reaction gases supplied from the post processing gas

supply units remove the element remaining in the exclusive supply nozzles and the reaction chamber and form a desired film in the reaction chamber. Saito et al further discloses a method for removing the fluoride hydrogen gas used for (Para 0176) cleaning the apparatus by alternately repeating supplying and vacuuming nitrogen (purge) gas. For example, as illustrated in the sequence diagram shown in FIG. 5 (Para 0177), after cleaning the apparatus with the fluoride hydrogen gas and vacuuming the gas, the cycle of supplying and vacuuming the nitrogen gas is repeated for eleven times (eleven cycles). Then, the fluoride hydrogen gas which remains within the reaction tube 11 and the exhaust pipe 63 can be removed. Decompressing the reaction tube 11 and supplying the nitrogen gas there into are repeatedly performed (Para 0186) for a given number of times, for example, three times (three cycles). After having thus repeated decompressing the reaction tube 11 and supplying the nitrogen gas there into, in a case where the reaction tube 11 is decompressed, the valve VB5 is open so as to supply alkoxysilane (preferably TEOS) into the reaction tube 11 (Para 0187) from the third gas source 35c. In a state where the pressure within the reaction tube 11 is controlled approximately at 133 Pa after the opening degree of the combination valve CV is controlled, exhaustion of the gas is continuously performed for a predetermined time period, for example, two minutes or so.

A controller 75 for controlling the function of all the valves 35a to 35d, 36a and 36b and controls the temperature of each part of the apparatus (Para 0122, 0124). The controller 75 automatically controls a series of processes by sending a control signal, etc., to each part of the apparatus. In Fig 6, Saito shows for example, different steps of

a process such as cleaning the apparatus, then vacuuming to remove the cleaning gas (and removed deposits in the cleaning gas), supplying a purge (nitrogen gas), then again vacuuming, supplying a reaction gas (post processing gas), again supplying nitrogen gas and then again vacuuming (Para 0176 through 0195).

Regarding claim 3, each of the reaction gases supplied from said post-processing gas supply unit removes the element remaining in said exclusive supply nozzles and said reaction chamber, and the reaction gases form a desired film in said reaction chamber. It is the intended use of the apparatus and the apparatus of Saito et al is capable of supplying reaction gases from the said post-processing gas supply unit to remove the element remaining in the said exclusive supply nozzles and the said reaction chamber and the reaction gases form a desired film in the said reaction chamber.

Regarding claims 5 and 6, the cleaning gas (source 35 d, fig 1) is a gas (HF) containing fluorine and the gas including silicon is the first gas DCS (SiH2Cl2, Para 0093).

Regarding claim 9, a heater 16 (Fig 2, Para 0089) surrounding the circumference of the reaction tube 11. Setting the temperature in the reaction container when the plurality of reaction gases are supplied after the cleaning gas is supplied and before a substrate is processed lower than the temperature in the reaction container when the cleaning is carried out is the intended use of the apparatus. And the apparatus of Saito et al is capable of performing such functions.

Saito et al does not specifically disclose:

Regarding claims 1 and 8, the controller controlling the post-processing gas supplying the post-processing gas after the cleaning gas is supplied to the said container and before the substrate is placed in the container,

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the processing steps as shown in Fig 6 were carried out before placing the substrate in the processing apparatus.

Saito et al further does not disclose:

Regarding claims 1 and 8, the said controller controls the post-processing gas supply unit to supply each of the reaction gases alternately from the exclusive supply nozzles.

Regarding claims 4 and 10, a plasma generating device wherein the gases are activated.

Oh et al disclose:

Regarding claims 1 and 8, a gas flow controller (not shown) installed at the gas supply pipes is controlled on time basis, so that the activated H2O vapor and the trimethyl aluminum gas are repeatedly supplied into the chamber alternately (Para 0080).

Regarding claims 4 and 10, two remote plasma generators 350a, 350b (Fig 3) for exciting the process gases (Para 0060, 0062).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the controller of Saito et al to also alternately

supply the reaction gases from the exclusive supply nozzles in the apparatus of Saito et al as taught by Oh et al. It would have been obvious to a skilled artisan to combine the prior art elements to yield predictable results such as modifying the controller of Saito et al for supplying the process gases alternately in the apparatus of Saito et al as taught by Oh et al.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a remote plasma generator in the apparatus of Saito et al to excite process and/or cleaning gases. It would have been obvious to a skilled artisan to combine the prior art elements to yield predictable results such as providing a remote plasma generator for the purpose of exciting gases in the apparatus of Saito et al as taught by Oh et al.

The motivation for replacing the controller of Saito et al with the controller of Oh et al is to alternately supply reaction gases from the exclusive supply nozzles in the apparatus of Saito et al to form layers of desired film on the substrate.

The motivation for providing a remote plasma generator in the apparatus of Saito et al to excite process and/or cleaning gases.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (US 2002/0073923) in view of Oh et al (US 2001/0029891) as applied to claims 1, 3 – 6 and 8 - 10 above and further in view of Choi et al (US 6,279, 503).

Saito et al and Oh et al do not teach if the cleaning gas is NF3 or ClF3.

Choi et al disclose: ClF3 as the cleaning gas (Column 4, lines 34 – 37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use ClF3 as the cleaning gas in the apparatus of Saito et al and Oh et al as taught by Choi et al.

The motivation for using ClF3 gas as a cleaning gas is that it is an alternate and equivalent cleaning gas for cleaning the pipe lines, nozzles and the chamber walls as taught by Choi et al.

Response to Arguments

Regarding the arguments:

Rejections under 35 U.S.C. § 103

Claims 1, 3-6 and 8-10 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Publication No. 2002/0073923 to Saito et al. ("Saito") in view of U.S. Publication No. 2004/0008336 to Lam et al. ("Lam") and U.S. Publication No. 2001/0029891 to Oh et al. ("Oh"). Applicants submit that the Examiner has failed to establish a prima-facie case of obviousness and respectfully traverse the rejection In order to establish a prima-facie case of obviousness under 35 U.S.C. § 103(a), the cited references must teach or suggest each and every element in the claims. See M.P.E.P. § 706.020); M.P.E.P. § 2141-2144.

Independent claims 1 and 8 recite a substrate processing apparatus wherein the controller controls the post-processing gas supply unit to supply each of the reaction gases alternately from the exclusive supply nozzles. Neither Saito nor Lam, alone or in combination, suggest this feature. Moreover, the newly cited reference to Oh also fails to suggest this feature. Therefore, Applicants submit that claims 1 and 8, and the claims dependent thereon, are patentable over Saito in view of Lam and Oh. Therefore, it is respectfully submitted that the rejection under 35 U.S.C. § 103(a) does not teach or suggest each and every element of the claim and therefore should be withdrawn.

The Examiner disagrees because of the following reasons:

The reference of Saito et al teaches all the limitation of claims 1 and 8 as explained above. Saito et al discloses a method for removing the fluoride hydrogen gas used for (Para 0176) cleaning the apparatus by alternately repeating supplying and vacuuming nitrogen (purge) gas. For example, as illustrated in the sequence diagram shown in FIG. 5 (Para 0177), after cleaning the apparatus with the fluoride hydrogen gas and vacuuming the gas, the cycle of supplying and vacuuming the nitrogen gas is repeated for eleven times (eleven cycles). Then, the fluoride hydrogen gas which

remains within the reaction tube 11 and the exhaust pipe 63 can be removed. Decompressing the reaction tube 11 and supplying the nitrogen gas there into are repeatedly performed (Para 0186) for a given number of times, for example, three times (three cycles). After having thus repeated decompressing the reaction tube 11 and supplying the nitrogen gas there into, in a case where the reaction tube 11 is decompressed, the valve VB5 is open so as to supply alkoxysilane (preferably TEOS) into the reaction tube 11 (Para 0187) from the third gas source 35c. In a state where the pressure within the reaction tube 11 is controlled approximately at 133 Pa after the opening degree of the combination valve CV is controlled, exhaustion of the gas is continuously performed for a predetermined time period, for example, two minutes or so.

The controller of Saito et al controls the function of all the valves 35a to 35d, 36a and 36b and controls the temperature of each part of the apparatus (Para 0122, 0124). The controller 75 automatically controls a series of processes by sending a control signal, etc., to each part of the apparatus. In Fig 6, Saito shows for example, different steps of a process such as cleaning the apparatus, then vacuuming to remove the cleaning gas (and removed deposits in the cleaning gas), supplying a purge (nitrogen gas), then again vacuuming, supplying a reaction gas (post processing gas), again supplying nitrogen gas and then again vacuuming (Para 0176 through 0195) which reads on the claimed language of claims 1 and 8.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by

combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

There is no need to combine the reference of Saito et al with the reference of Lam et al and therefore the reference of Lam et al has been removed without changing the rejection.

Regarding the arguments:

More specifically, claims 1 and 8 require a gas supply system controller that supplies a cleaning gas and then subsequently supplies post-processing gases for removing the undesirable elements remaining from the cleaning gases by alternately supplying each of the reaction gases from their exclusive supply nozzles. Saito and Lam have been discussed at length before, such as in the response filed January 9, 2008, which is incorporated herein. The Examiner now indicates in the instant Office Action that Oh has been cited and applied to show this feature. Oh shows an atomic layer deposition (ALD) apparatus and process wherein very thin film layers (one atom thick) may be deposited by alternate application of an activated first material gas and a non-activated second material gas. The Examiner points to paragraph [0080] of the reference in the Office Action on page 5 in support of the motivation for alternately applying each of the post-processing gas supply units. A careful review of Oh reveals that it is alternately applying the deposition gases, not the post cleaning gases. Oh indicates in paragraph [0074] that it is possible to perform a cleaning step by introducing SF6, which could correspond to the instant claimed cleaning gas, and the cleaning gas HF for the cleaning step in Saito, see paragraphs [0148]-[0151]. But Oh does not even disclose a step after the cleaning process to remove cleaning process contaminants that result from cleaning, much less teach that such an additional step would include reaction gases alternately supplied. Therefore, it is submitted that a teaching relating to the alternate application of film forming gases in an ALD apparatus does not reasonably suggest that alternate application of chemical vapor deposition CVD reaction gases would serve to remove contaminants left from a cleaning gas. Moreover, Saito is directed to chemical vapor deposition processes where the reactant deposition gases must be mixed in order to achieve the reaction necessary to form the desired layer. It would appear that any attempt to alternately supply the reaction gases in Saito would destroy the CVD process. Finally, it is submitted that the only suggestion in the record, that alternate application of reaction gases would solve the problem of leftover cleaning residue of HF cleaning gas, comes from Applicants' own disclosure. Reliance upon Applicants' own disclosure would, of course, be inappropriate

The Examiner again disagrees because of the following reasons:

As explained, the reference of Saito et al teaches supplying a reaction gas TEOS (post processing gas) for removing the remaining cleaning gas in the processing system. Saito et al, however, does not teach supplying gases alternately. The reference of Oh et al teaches a system wherein gases are supplied alternately. It would have been obvious to a skilled artisan to combine prior art elements to yield predictable results such as combining the teachings of Saito et al and Oh et al to modify the controller of Saito et al to also alternately supply the desired gases in the processing apparatus. Applicant should note that these are apparatus claims and not method claims. Further it has been held claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). If a prior art structure is capable of performing the intended use as recited in the preamble, then the preamble does not define over it. In re Schreiber, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1431 (Fed. Cir. 1997). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Regarding the arguments:

Claim 3 requires that each of the reaction gases supplied from the post-processing gas supply unit removes the element remaining in said exclusive supply nozzles and said reaction container, and the reaction gases form a desired film in said reaction container.
The Examiner refers to paragraphs 0093, 0094, 0095 and 0097 of Saito for a teaching of these features. To the contrary, it is respectfully submitted that Saito fails to disclose that each of the reaction gases supplied from the post-processing gas supply unit removes the element remaining in said exclusive supply nozzles and said reaction container, and the reaction gases form a desired film in said container. Therefore, for this reason as well as the reason noted above with respect to claim 1, it is submitted that claim 3 is patentable over Saito in view of Lam and Oh. Claims 4-6 depend from claim 3, and it is submitted that these claims are also patentable at least for the same reasons as claims 1 and 3.

The Examiner again disagrees because of the following reasons:

Saito et al teaches in Para 0151, cleaning gas, fluoride hydrogen is supplied to the inlets 64a to 64c for a predetermined time period, for example, ten minutes or so. The fluoride hydrogen so flows into the lower portion of the manifold 17 from the inlet 64a as to clean the lower portion and the inner wall of the inner tube 13, and gradually goes upward to clean the upper portion thereof. The fluoride hydrogen drops down to the gap between the outer tube 12 and the inner tube 13, cleans the outer wall of the inner tube 13 and the inner wall of the outer tube 12, and flows into the exhaust port 61. The arguments of supplying post-processing gas for removing the elements remaining in the cleaning gas has already been discussed above using the Saito reference. The reference of Saito et al reads on the claimed language.

Regarding the arguments:

Independent claim 8 recites a control apparatus for controlling the substrate processing apparatus such that cleaning gas is supplied from one of the supply nozzles into said reaction container at the time of cleaning, and all reaction gases used for processing a substrate are alternately supplied into said reaction container from the exclusive supply nozzles.

Neither Saito nor Lam nor Oh, alone or in combination, suggest a control apparatus for controlling the substrate processing apparatus such that cleaning gas is supplied from one of the supply nozzles into said reaction container at the time of cleaning, and all reaction gases used for processing a substrate are alternately supplied into said reaction container from the exclusive supply nozzles. Therefore, for this reason it is submitted that claim 8 is patentable over Saito in view of Lam and Oh.

The additionally applied art to Choi et al. (U.S. Patent No. 6,279,503) fails to show or suggest any of the missing features discussed above and therefore cannot remedy the failure to teach such features with respect to claims 1, 3 and 8.

The Examiner again disagrees because of the following reasons:

Saito et al teaches supplying cleaning gas from a cleaning gas source 35d (Fig 1) via inlet nozzles 64a, 64b and 64c whereas the reaction gases are supplied from

different nozzles 31a, 31b, 31c. Regarding alternating supplying the reaction gases, this has already been discussed above. The reference of Choi et al also reads on the claimed language of claim 7.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SATISH CHANDRA whose telephone number is (571)272-3769. The examiner can normally be reached on 8 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, Primary Examiner, Jeffrie R. Lund can be reached on 571-272-1437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jeffrie R. Lund/
Primary Examiner, Art Unit 1792

Satish Chandra

Jeffrie R. Lund
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SC
5/30/2008